A NOVEL STUDY OF EARTH ATMOSPHERE AND SPACE ELEMENTS AND ITS INFLUENCE

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ABSTRACT:

This paper furnish and discuss about a detailed knowledge sharing about the earth its atmosphere layer and the planet its motion and elements of the universe . which also discuss about the parameters of space elements such as Asteroid, Meteoroids and meteors its description and concepts . this paper would give a crystal environment about the atmosphere and will be helpful for the researchers and students in the world of art science and engineering

Key words : planet , atmosphere , earth layer , space elements

INTERNATIONAL STANDARD ATMOSPHERE

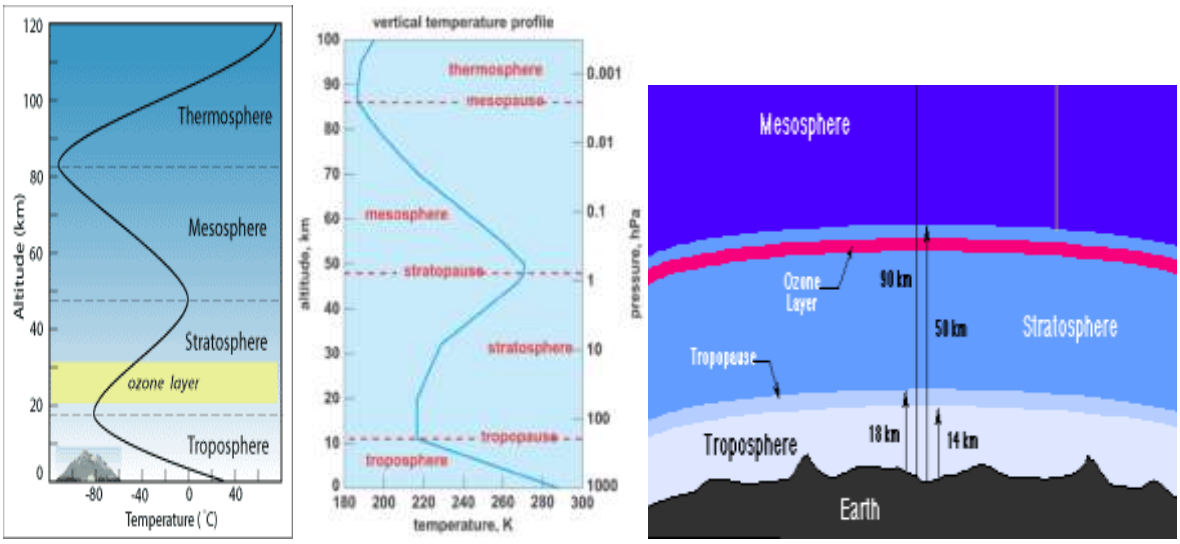
It is important to understand the definition of various altitudes that are usually used to analyze/compare the performance of flying vehicles in standard atmosphere.The gravitational force experienced by any aircraft varies with altitude. Also, an aircraft experiences variation in aerodynamic forces with altitude. This is simply because of the fact that the atmospheric properties viz; Pressure, density and Temperature (P; ρ; T) also changes with altitude. Aerodynamic forces are strong function of these atmospheric properties (P; ρ; T). It is a necessity to specify the altitude that will help in postulating gravitational and aerodynamic forces explicitly. Standard atmosphere is defined in order to relate flight tests, wind tunnel tests general airplane design and performance to a common reference.

1. Absolute altitude (h_a) : The altitude as measured from the center of the earth.
2. Geometric altitude (h_g) : The altitude as measured from the mean sea level.
3. Geo-potential altitude (h) : The geometric altitude corrected for the gravity variation.

The atmosphere is divided into 4 major layers according to the changes in temperature and are Thermosphere 80 KM & up, Mesosphere 50 to 80 KM, Stratosphere 12 to 50 KM, Troposphere 0 to 12 KM - Ionosphere - Exosphere

Troposphere (0 – 12 km)

It Contains 75 % of the total gas in the atmosphere in fact this layer is where we live and change in weather occurs . The temperature drops about 6.5° C for every one kilometer . this is the warmest temperatures in the troposphere are near the surface with the coldest

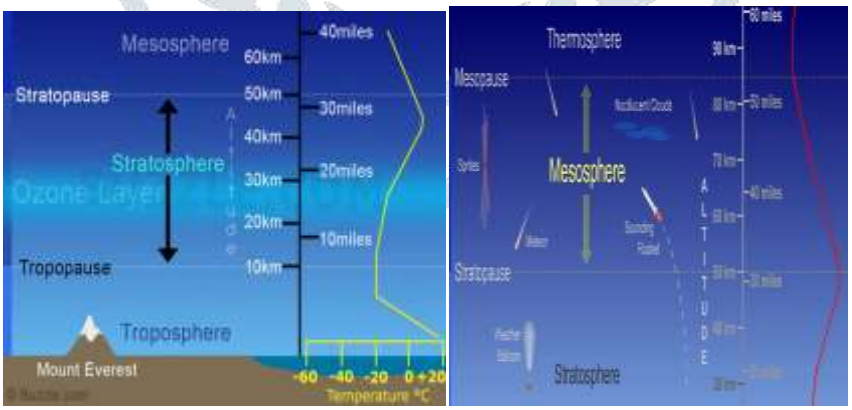


Layer of atmosphere

temperatures being at the top of the troposphere. Although the sun light comes from the top to the bottom of the atmosphere, the troposphere is primarily heated from the bottom. because the earth surface is much better at absorbing wide range of solar radiation as compared to the air. The surface is warmed by the sun and then this energy is distributed upwards into the troposphere through a mixing of the air. Since the earth's surface is the primary heat source, temperatures will be warmest at the surface and decrease away from the surface. Located at the top of the troposphere. Temperature maintain constant at this instant .The layer separate the Troposphere from the stratosphere .

Stratosphere (12 to 50 Km)

It is the lower part of stratopause. The increase of temperature with altitude, is a result of the absorption of the Sun's ultraviolet radiation by ozone. This is in contrast to the troposphere, near the Earth's surface, where temperatures decreases with altitude. After the tropopause , marks where this temperature inversion begins.



Stratosphere , mesosphere

Mesosphere (50 to 80 Km)

The mesosphere, temperature decreases as the altitude increases. The upper boundary of the mesosphere is the mesopause , Which can be the coldest naturally occurring place on Earth with temperatures below 130 K (−143 °C). The exact upper and lower boundaries of the mesosphere vary with latitude and with season But the lower boundary of the mesosphere is usually located at heights of about 50 kilometers. This layer protects earth from meteoroids

Thermosphere (80 Km & up)

The air is very thin Thermosphere means heat sphere The temperature is very high in the layer in this layer UV radiation turns in to heat. Temperature often reaches 2000°C it is influenced by Ionosphere and Exosphere. An aurora, sometimes referred to as a polar light, is a natural light display in the sky, largely seen in the high latitude regions. Apart form these layers Magnetosphere – the area around the earth that extends beyond atmosphere

SOLAR SYSTEM

The Solar System is the name given to the Sun and its family of planets. This family of planet consists of eight planets and a belt of minor planets or asteroids. They all move in elliptical orbits around the sun due to its force of gravitational attraction. The eight major planets in the Solar System are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto was considered to be the ninth planet until 2006 when it was reclassified as a dwarf planet. It has an orbit more common with asteroids rather than the other planets and astronomers suspect that it might once have been a moon of Neptune. Astronomers have divided the eight major planets into two groups: terrestrial and Jovian.

Terrestrial Planets

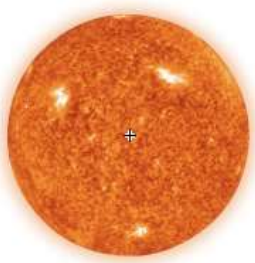
The terrestrial planets are Mercury, Venus, Earth and Mars and are made up mostly of Iron and silicate rocks and lie closer to the Sun.

Jovian Planets

The Jovian planets are Jupiter, Saturn, Uranus and Neptune and are made up mostly of Hydrogen and Helium. Because of their gaseous composition they are also referred to as the Gas Giants. The Jovian planets are the larger more massive planets with strong magnetic fields and they rotate more rapidly about their axes. Unmanned space probes have shown the Jovian planets have ring systems with moons orbiting them.

The Sun

The sun lies in the centre of the Solar System. It is a yellow dwarf star. It has a surface temperature of approximately 6000°C. Its diameter is about 865,000 miles approximately 109 times the diameter of the Earth. By mass the sun is made up of 71% Hydrogen, 28% Helium and the remaining 1% mass comprising heavier atoms such as Carbon, Nitrogen, Oxygen, Silicon and Iron. The sun contains 99% of the Solar Systems mass. It has no fixed surface and the temperature is too high for the matter to exist as a solid or a liquid. Due to this different parts of the sun rotate at different rates. The parts of the surface near the equator complete a rotation in 25 Earth days, whereas the parts near the pole take 36 days.



Sun , Mercury, Venus,

Earth

Mercury

Mercury is the smallest of the eight planets in the solar system. It is the planet with the closet orbit to the sun. Its orbit lies between the sun and the orbit of Venus and it has no known moons. Mercury has a diameter of approximately 3000 miles. It is made up of a high percentage of metal making it the densest planet in the solar system. It takes Mercury 88 Earth days to orbit the sun. The fast orbit is offset by the planets slow spin. It takes Mercury 59 Earth days to complete one rotation about its axis.

Venus

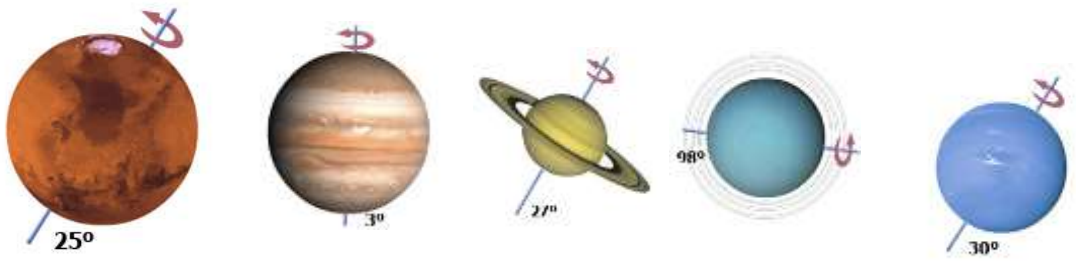
Venus is the second planet from the sun. Its orbit lies between the orbits of Mercury and Earth and has no known moons. It is the closest planet to the Earth and after the moon is the most brilliant natural object in the night sky. Venus has a diameter of approximately 12,100 km making it slightly smaller than Earth (Earth's diameter is approximately 12,750 km). Although further away from the sun than Mercury, Venus is the hottest planet in the solar system. This is because it has a very large atmosphere made up mostly of Carbon Dioxide. This thick, dense atmosphere traps the heat radiated from the planet's surface and the sun (greenhouse effect) making the average temperature on Venus about 460°Celsius. Venus spins about its axis very slowly taking 243 Earth days to complete one rotation, which is the length of a day on Venus. It completes one orbital revolution of the sun in 225 Earth days making Venus the only planet where a day is longer than a year. Venus rotates about its axis in a retrograde motion i.e. in a direction opposite to the other planets. Venus and Neptune are the only planets which rotate counter clockwise while the other 6 planets rotate clockwise.

Earth

Earth is the third planet from the sun. It is the only planet that hosts all known life. Its orbit lies between Venus and Mars and has one moon. The Earth has a diameter at the equator of 12,756km. It spins about its axis once every 24 hours (1 Earth day) and takes 365.256 days to orbit the sun. The Earth's atmosphere is made up of 78% Nitrogen, 21% Oxygen and the remaining 1% consists of other gases such as Argon, Carbon Dioxide, Methane and Hydrogen.

Mars

Mars is the fourth planet from the sun. The orbit of Mars lies between Earth's orbit and Jupiter's orbit. Between Mars and Jupiter lies the main asteroid belt. Mars has two small moons called Phobos and Deimos. Mars is the second smallest planet in the solar system. Its diameter at the equator is approximately 6,800km. It takes Mars 687 days to complete one revolution of the sun. Thus, one year on Mars is equivalent to almost 2 Earth years. Mars is called the red planet due to the reddish brown Iron Oxide on its surface. Its atmosphere is made up mostly of Carbon Dioxide, however the atmosphere is very thin making the average temperature on the surface average about -70°Celsius.



Mars Jupiter Saturn Uranus Neptune

Jupiter

Jupiter is the fifth planet from the sun. It is the largest planet in the solar system with a diameter at the equator of approximately 143000km. More than 1300 Earths can fit inside Jupiter. Jupiter holds more matter than all the other planets in the solar system. Its strong gravitational pull is accountable for the many moons that orbit the planet. To date more than 60 known moons orbit Jupiter. It completes one rotation in 9hours 55 minutes, which is the length of a day on Jupiter. It takes about 11.9 earth years to orbit the sun. Jupiter has no solid surface. It is composed mainly of Hydrogen and Helium. The large pressures in the planets interior account for Hydrogen and Helium in the liquid form surrounded by a gaseous atmosphere. The Great Red Spot is a huge oval shape storm system in the planets southern hemisphere.

Saturn

Saturn is the sixth planet from the sun. After Jupiter it is the second largest planet in the solar system. Its diameter at the equator is approximately 75000 miles (120,500 km). Saturn's orbit lies between Jupiter and Uranus and it takes about 30 Earth years to complete one revolution around the sun. It rotates about its axis in 10.8 hours, which is the length of a day on Saturn. Saturn like Jupiter is one of the gas giants and is composed mostly of Hydrogen and some Helium. Saturn's most famous feature is its ring system. This is made up of hundreds of thousands of individual rings held in orbit by the pull of Saturn's gravity. The rings are made up of countless ice chunks and dust particles. In addition to the ring system there are more than 50 known moons that orbit Saturn.

Uranus

Uranus is the seventh planet from the sun. Its diameter at the equator is about 32000 miles (51500 km) making it the third largest planet in the solar system. It takes Uranus 84 Earth days to complete one trip around the sun. Uranus completes one rotation on its axis in approximately 17 Earth hours, which is a length of a day on Uranus. Uranus is different to the other planets in that its rotation axis lies nearly to its side as it goes around the sun. Like Venus it rotates about its axis in a retrograde motion. Scientists think that this alignment may have been caused by violent collisions with other bodies early in its history. Uranus has a liquid interior due to very high temperatures and pressures inside the planet. It is made up of the melted ices of water, methane and ammonia, along with molten rock and metals and small amounts of Hydrogen and Helium. Uranus has a massive atmosphere made up of approximately 75% Hydrogen and 25% Helium with small amounts of methane, water and ammonia. Uranus has a system of about 12 narrow rings; the rings are made up of countless particles orbiting the planet. Uranus has 5 major moons and more than 20 smaller ones.

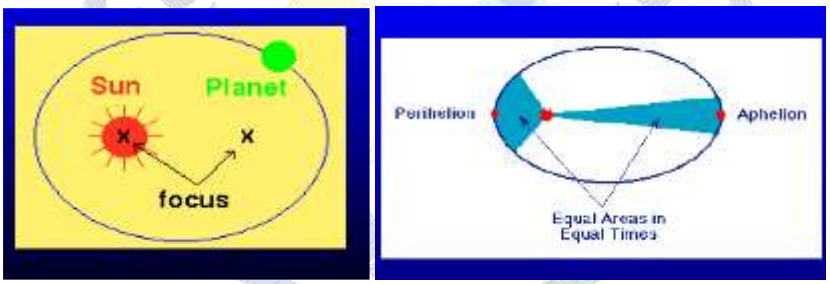
Neptune

Neptune is the eight and farthest most planet from the sun and cannot been seen by the unaided eye. It has a diameter of approximately 31000 miles (50000 km). It takes Neptune 146 Earth years to orbit the sun. Neptune takes 16 hours to complete one rotation about its axis, which is a length of a day on Neptune. Like the other gas giants Neptune has a massive atmosphere made mostly of Hydrogen with some Helium and about 2% of Methane. It is the Methane in Neptune's atmosphere that makes it appear bluish in colour. The interior is similar to Uranus being made up of melted ices of water, Methane and Ammonia, along with molten rocks and metals. Neptune has 6 narrow rings composed of dust size particles orbiting the planet. Neptune has 13 known moons.

Pluto

Pluto was discovered in 1930 and was considered the ninth planet of the solar system up until 2006 when it was classified as a dwarf planet. This was due to many other objects of a similar size to Pluto being discovered in a region where it lies called the Kuiper belt. So, rather increase the number of planets each time a new object was discovered the definition of planets was redefined to exclude objects such as Pluto and a new category called dwarf planets was designated for Pluto. Pluto has a diameter of about 1500 miles (2400 km). It takes Pluto 248 years to complete a trip around the sun, which is the length of a year on Pluto. It completes one rotation about its axis in 6.4 Earth days. Its atmosphere is composed of Nitrogen with small amounts of Methane and Carbon Monoxide. Its ineterior is thought to be made of rock and ice. Because of its great distance from the sun the surface temperature on Pluto is extremely cold. Pluto has one known moon.

KEPLER'S LAWS



Kepler,s concept

Kepler's First Law -The planets move in elliptical orbits with the sun at one focus.

Kepler's Second Law - Kepler's Second Law is based on the speed of the object as it orbits.

It states that in their orbits around the sun, the planets sweep out equal areas in equal times.

Kepler's Third Law- The big mathematical accomplishment for Kepler is in his Third Law, where he relates the radius of an orbit to it's period of orbit (the time it takes to complete one orbit). The squares of the times to complete one orbit are proportional to the cubes of the average distances from the Sun.

$$K = \frac{T^2}{r^3}$$

T = period (in any unit, usually seconds)

r = radius (in any unit, usually metres)

K = Kepler's Constant

ASTEROIDS AND METEOROIDS

Asteroid

An asteroid is a celestial body - composed of rock, metal or a mixture of both - that is orbiting the Sun. Most of them are in the asteroid belt between Mars and Jupiter. Even though there are millions of asteroids with sizes up to more than 500 km (like Pallas and Vesta) they are of no danger to the planet Earth. The biggest body in the asteroid belt - Ceres - is officially not called an asteroid anymore but a dwarf planet. If you try to envision the asteroid belt don't get fooled by some science fiction films: travelling around in the asteroid belt with your spacecraft doesn't require constant steering in order to avoid crashes with asteroids. The scale of the solar system is so immense that even inside the asteroid belt the average distance between two asteroids is above one million km - or three times the distance between Earth and the Moon.



Asteroid, Meteoroids and meteors

Meteoroids and meteors

Generally speaking, meteoroids are all the smaller objects in orbit around the Sun. Most of them originate from comets that lose gas and dust when they approach the Sun. Other meteoroids are basically small asteroids. There is no exact diameter that distinguishes an asteroid from a meteoroid. Wikipedia states 10 metres; other trustworthy sites call anything smaller than 1 km a meteoroid. Anyhow, the vast majority of all meteoroids are just a few millimetres and less in size. The smallest and by far the most numerous ones have sizes of small dust particles and are called micrometeoroids; they do not leave any visible trace behind when they enter the Earth's atmosphere.

The ones about the size of a pebble leave behind a flash of light when they completely vaporise. Most people call this flash a "shooting star" or a "falling star", but more accurately spoken this is a meteor. A meteor is the light that you can see when a small meteoroid enters the Earth’s atmosphere. This normally happens with speeds between 11 and 73 km/s and at altitudes of about 75-120 km. Under a clear sky an observer can see 5 to 10 meteors per hour, especially after midnight when the Earth has rotated so far that the observer's part of the sky is positioned in the direction of the Earth's motion around the Sun. During so called meteor showers the rate of observable meteors per hour can increase significantly. Meteor showers are caused when the Earth crosses higher than usual concentrations of particles that are themselves in an eccentric orbit around the Sun. Since the orbit of these particles is fixed, we encounter this stream every year at the same time - just its density cannot be foreseen. This sometimes leads to sparse meteor showers and sometimes very intense meteor showers with more than 1000 meteors per hour, also called meteor outbursts or meteor storms. The meteors we see can be debris from a comet (> 90% of all meteors we see) or an asteroid. The most famous meteor showers are the Perseids in mid-August (caused by Comet 109P/Swift-Tuttle) and the Leonids (mid-November). The meteors during these meteor showers almost all emerge from the same section of the sky; indeed the meteor showers are named for the constellations from which the meteors appear to originate.

Smaller meteoroids will be heated by adiabatic compression until the point when they completely disintegrate. However, the light emission we observe is mainly caused by interactions between evaporated and detached components of the fast moving meteoroid and air molecules. Both the meteoroid atoms and the air molecules ionize during this encounter. When the free electrons recombine with the ionized atoms in the tail of the meteoroid they emit the light that we can observe. The light track can have a length of up to several tens of kilometres and an initial diameter of a few metres. The colour of the meteor is an indicator of the material of the meteoroid; e.g., a yellow colour is caused by iron, a blue-green colour by copper and a red colour by silicate material. A meteor that is larger and brighter than normal is called a fireball; brighter than the brightest planet in our night sky (Venus). If these fireballs also break apart or explode during their atmospheric flight - sometimes accompanied by considerable audible sounds - they are called a bolide.

Comets

Comets are asteroid-like objects which are composed of ice, dust and rocky particles; that's why they are also called 'dirty snowballs'. The sizes of their nuclei vary between a few hundred metres to tens of kilometres in diameter; their visible tails can extend to above 150 million km in length. They originate from outside Neptune's orbit and - like many asteroids and meteoroids - are unmodified remnants of the formation of our solar system about 4.568 billion years ago. When comets approach the Sun the solar radiation and solar winds cause particles to sublimate and detach from the comet, forming a tail of particles which often makes them visible in the night sky even to the naked eye. We say 'sublimate' (a direct phase transition from the solid to the gas phase) since with zero pressure in space, water will not exist in the liquid phase. Anyhow, below its surface there can also be reservoirs of liquid water which can vaporise and feed jets of water vapour.

Conclusion

The paper elaborate the study of atmosphere its behaviour with respect to altitude. Apart from that it discusses all atmosphere layer and concept of motion of planets and other elements in space which gives a detailed on board understanding to the aerospace students and aerospace fertility

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